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COMPARISON OF DEPARTMENT OF DEFENSE INFORMATION TECHNOLOGY ACQUISITION PROCESSES: A CASE STUDY

by

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September 2001

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13. ABSTRACT

This thesis presents a comparison and analysis of two Department of Defense (DoD) acquisition methods: the formal acquisition process and the Advanced Concept Technology Demonstration (ACTD). Both processes can be and are used by DoD to acquire information technology (IT), but while DoD has utilized the formal acquisition process for 30 years, the ACTD process is only 6 years old, and was specifically designed to improve upon the standard acquisition process (when applied to IT). By describing and studying the events surrounding, actors participating in, and results of one ACTD, this thesis will determine what lessons-learned can be applied to the standard acquisition process. While the ACTD and acquisition processes share some similarities in their management and funding, there are also significant differences. For example, ACTDs gain approval through a completely different process than acquisitions, and are subjected to less bureaucratic oversight. The recommendations provided in this thesis indicate that, based upon the experiences of the real-life ACTD sampled, the ACTD process does represent an improvement upon the standard acquisition process, specifically when the standard process is utilized to acquire IT.

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COMPARISON OF DEPARTMENT OF DEFENSE INFORMATION TECHNOLOGY ACQUISITION PROCESSES: A CASE STUDY

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ABSTRACT

This thesis presents a comparison and analysis of two Department of Defense (DoD) acquisition methods: the formal acquisition process and the Advanced Concept Technology Demonstration (ACTD). Both processes can be, and are, used by DoD to acquire information technology (IT), but while DoD has utilized the formal acquisition process for 30 years, the ACTD process is only 6 years old, and was specifically designed to improve upon the standard acquisition process (when applied to IT). By describing and studying the events surrounding, actors participating in, and results of one ACTD, this thesis will determine what lessons-learned can be applied to the standard acquisition process. While the ACTD and acquisition processes share some similarities in their management and funding, there are also significant differences. For example, ACTDs gain approval through a completely different process than acquisitions, and are subjected to less bureaucratic oversight. The recommendations provided in this thesis indicate that, based upon the experiences of the real-life ACTD sampled, the ACTD process does represent an improvement upon the standard acquisition process, specifically when the standard process is utilized to acquire IT.

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LIST OF ABBREVIATIONS

1st FSSG	1st Force Service Support Group
ACAT	Acquisition Category
ACMC	Assistant Commandant of the Marine Corps
ACTD	Advanced Concept Technology Demonstration
ACQ	DoD 5000 Acquisition/Formal Acquisition Program
AIS	Automated Information System
APB	Acquisition Program Baseline
AR	Assessment Report
ASD(C3I)	Assistant Secretary of Defense for Communications, Computers, and Intelligence
ATD	Advanced Technology Demonstration
AWE	Advanced Warfighting Experiment
BSSG-1	Brigade Service Support Group 1
C2	Command and Control
CC	Command and Coordination
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAE	Component Acquisition Executive
CAX	Combined Arms Exercise
CE	Concept Exploration
CIO	Chief Information Officer
CNA	Center for Naval Analysis
CONOPS	Concept of Operations
CPIPT	Cost Performance IPT
CSS	Combat Service Support
CSSE	Combat Service Support Element
DAB	Defense Acquisition Board
DAE	Defense Acquisition Executive
DAMP	Design Assessment Master Plan
DARPA	Defense Advanced Research Projects Agency

DAWIA	Defense Acquisition Workforce Improvement Act (Public Law 102-484)
DD	Demonstration Design
DoD	Department of Defense
DoN	Department of the Navy
DOTES	Doctrine, Organization, Training, Education, and Systems
DRR	Demonstration Readiness Review
DUSD(AS&C)	Deputy Undersecretary of Defense for Advanced Systems and Concepts
EMD	Engineering & Manufacturing Development
EUE	Extended-User Evaluation
FAR	Federal Acquisition Regulation
FY	Fiscal Year
FYDP	Future Years Defense Plan
GOTS	Government Off-the-Shelf (software)
ID	Implementation Directive
IIPT	Integration IPT
IPPD	Integrated Product and Process Development
IPT	Integrated Product Team
IT	Information Technology
JROC	Joint Requirements Oversight Council
LCC	Life Cycle Cost
LCS	Life Cycle Support
LRIP	Low-Rate Initial Production
MAGTF	Marine Air-Ground Task Force
MAISRC	Major Automated Information System Review Council
MARCORSYSCOM	Marine Corps Systems Command
MCCDC	Marine Corps Combat Development Command
MDA	Milestone Decision Authority
MNS	Mission Needs Statement
MP	Management Plan
MUA	Military Utility Assessment

O&M	Operations & Maintenance
OIPT	Overarching IPT
ONR	Office of Naval Research
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
PANMC	Procurement of Ammunition, Navy & Marine Corps
PDRR	Program Definition and Risk Reduction
PEO	Program Executive Officer
PF/DOS	Production & Fielding, Deployment & Operational Support
PM	Program Manager
PM IS	Program Manager, Information Systems (at MARCORSYSCOM)
PMC	Procurement, Marine Corps
POA&M	Plan of Action & Milestones
POM	Program Objectives Memorandum
PPBS	Planning, Programming, & Budgeting System
R&D	Research & Development
RDT&E	Research, Development, Testing & Evaluation
S&T	Science & Technology
SAIC	Science Applications International Corporation
SEI&T	Systems Engineering, Integration, & Testing
SEMP	Systems Engineering Master Plan
SNCO	Staff Non-Commissioned Officer
SUL	Small Unit Logistics (an Advanced Concept Technology Demonstration)
TAV	Total Asset Visibility
TEMP	Test and Evaluation Master Plan
TIPT	Transition IPT
TPP	Transition Planning & Preparation
USD(AT&L)	Undersecretary of Defense for Acquisition, Technology, and Logistics
WIPT	Working-level IPT

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EXECUTIVE SUMMARY

The worldwide Information Technology (IT) industry is extremely fast moving, with new products, technologies, and standards being developed all the time. The Department of Defense (DoD) Acquisition Process, on the other hand, is traditionally slow moving, with years potentially elapsing between the initiation of a program and the fielding of a product. Realizing the disparity of timelines between the private sector driven domain of IT and the public sector DoD acquisition cycle, the Office of the Secretary of Defense created a new category of technology fielding program called the Advanced Concept Technology Demonstration (ACTD). The goal of creating the ACTD process was to streamline and speed-up the fielding of mature technologies to warfighters.

The acquisition process and the ACTD process differ in many respects, including their management structure, their funding profiles, and how each is initiated. Also, the potential outcomes of each process differ. That being said, similarities between ACTDs and acquisitions include the fact that both reside within the DoD, both require similar skill-sets of their managers, and both operate within the framework of the Planning, Programming, and Budgeting System (PPBS).

The goals of the ACTD and DoD 5000 acquisition processes are similar in that they both strive to satisfy requirements identified by warfighters. The difference is that the goal of the formal acquisition process is to fully develop and field a capability useful to warfighters, whereas ACTDs are intended to prove concepts. The Small Unit Logistics (SUL) ACTD was initiated in 1998 with the goal of becoming, via mature technology, an acquisition program. By studying the events and activities surrounding the SUL ACTD, as well as study of both the ACTD and acquisition processes, this thesis has identified areas in which the ACTD process represents an improvement, and distilled lessons that may improve upon the standard acquisition process.

The procedural comparison of processes and case-study analysis of the SUL ACTD yielded the following results. First, ACTDs are much easier to initiate than acquisitions due to a streamlined selection/approval process. Second, while the ACTD

process itself is less structured and requires less reporting and documentation from its managers than formal acquisition, the processes were designed for different purposes, and streamlining the acquisition process would negate some of the advantages inherent in its relatively rigid structure. Third, the management structure of ACTDs provides some advantages over that of acquisitions, but is not necessarily an improvement. Lastly, the way in which ACTDs are funded represents an improvement upon acquisition funding since it frees managers from having to fight for funding on a yearly basis, giving them more time and energy to focus on their ACTDs.

I. INTRODUCTION

The Department of Defense (DoD) is an agency within the Executive Branch of the United States Government that requires the use of up-to-date information technology to effectively perform its function. As defined by statute, Information Technology (IT)

> "… with respect to an Executive Agency means any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information…"[1]

The worldwide IT industry is extremely fast moving, with new products, technologies, and standards being developed all the time. The DoD Acquisition Process, on the other hand, is traditionally slow moving, with years potentially elapsing between the initiation of a program and the fielding of a product. Realizing the disparity of timelines between the private sector driven domain of IT and the public sector DoD acquisition cycle, the Office of Secretary of Defense (OSD) created a new technology fielding process called the Advanced Concept Technology Demonstration (ACTD). The goal of creating the ACTD process was to streamline and speed-up the fielding of mature technologies to warfighters.

> "Demonstrations based on mature technologies may lead to more rapid fielding. Where appropriate, managers in the acquisition community shall make use of non-traditional acquisition techniques, such as Advanced Concept Technology Demonstrations (ACTDs), rapid prototyping, evolutionary and incremental acquisition, and flexible technology insertion." [2]

By studying the processes followed, obstacles encountered, and experiences of one ACTD, this thesis will examine the following questions: Has the goal of establishing the ACTD alternative been met? If so, can lessons be distilled from an ACTD that may improve the standard acquisition process? If there are no advantages, should this alternative be removed from the options available to acquisition professionals?

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[1] Information Technology Management Reform Act Summary

[2] DoD 5000.2R, Para 2.7

The DoD 5000 series of directives is applicable to all the services, as are the directives establishing and directing ACTDs. Having stated that, this thesis will use as its primary source the procurement practices and processes of the United States Marine Corps. The decision to narrowly focus the scope was made for several reasons. The primary reason is that a complete study of the entire DoD Acquisition Process would require a much longer-term study. If such a task were undertaken, the result would be broadly focused, which would dilute the ACTD-specific recommendations this Thesis is attempting to make. A secondary reason is that the ACTD studied was focused on becoming a Marine Corps IT acquisition program. Therefore, only Marine Corps acquisition processes, within the scope of applicable DoD and DoN directives, will apply to this analysis.

To conduct this research, an ACTD has been selected and its primary decision-makers interviewed. The ACTD will be analyzed as a process whose goal is fielding an IT product to warfighters. When the analysis of the ACTD is complete, a comparison will be conducted between what actually took place during its lifecycle and the standard acquisition process. For the purpose of that comparison the process outlined in the DoD 5000 series of publications will be utilized. The results of this comparison will assess the usefulness and applicability of the ACTD as an alternative to standard IT acquisition, highlight the differences between the two, and make recommendations based upon the results.

II. THE FORMAL ACQUISITION METHOD

The Defense Department acquires goods and services based on a system governed by two documents, DoD 5000.1 The Defense Acquisition System and DoD 5000.2 Operation of the Defense Acquisition System. Both are sub-documents to the Federal Acquisition Regulation, or FAR. These two references constitute both the Old and New Testaments to acquisition professionals. The "5000 Series", as it is generally called, was introduced for the first time in 1971, and has since been revised 11 times. The most recent revision was signed on January 4th, 2001. For the purpose of comparison in this Thesis, the previous (1996 revision) 5000 Series document are used, since the subject ACTD occurred and was managed before the latest revision.

An acquisition program is very strictly defined as:

> "A directed, funded effort designed to provide a new, improved, or continuing materiel, weapon or information system capability, or service, in response to a validated operational or business need. Acquisition programs are divided into categories, which are established to facilitate decentralized decision-making, execution, and compliance with statutory requirements." [3]

Additionally, an acquisition program is defined as an Automated Information System program (AIS) when it involves the use of IT.

A. ACQUISITION CYCLE

Within the Marine Corps, the acquisition process begins when a material or informational deficiency or capability is identified to the Marine Corps Combat Development Command (MCCDC), either by a Unified Command or a command within the Corps. If a committee decides to pursue the deficiency, a team is formed to develop a Mission Needs Statement (MNS). The MNS (ref. Figure 2-1) defines the projected needs for a capability in general operational terms that state desired mission objectives and general capabilities. The MNS will also describe nonmaterial and potential material alternatives (to meet the need), as well as goals and objectives for the acquisition, estimated operational environments, logistical constraints, and a rough order-of-magnitude budgetary estimate. An acquisition program is formally initiated when the

[3] DoD 5000.1, Enclosure 2, subparagraph E2.1.2

MNS is approved and signed by the designated approval authority: the Commanding General of the MCCDC.

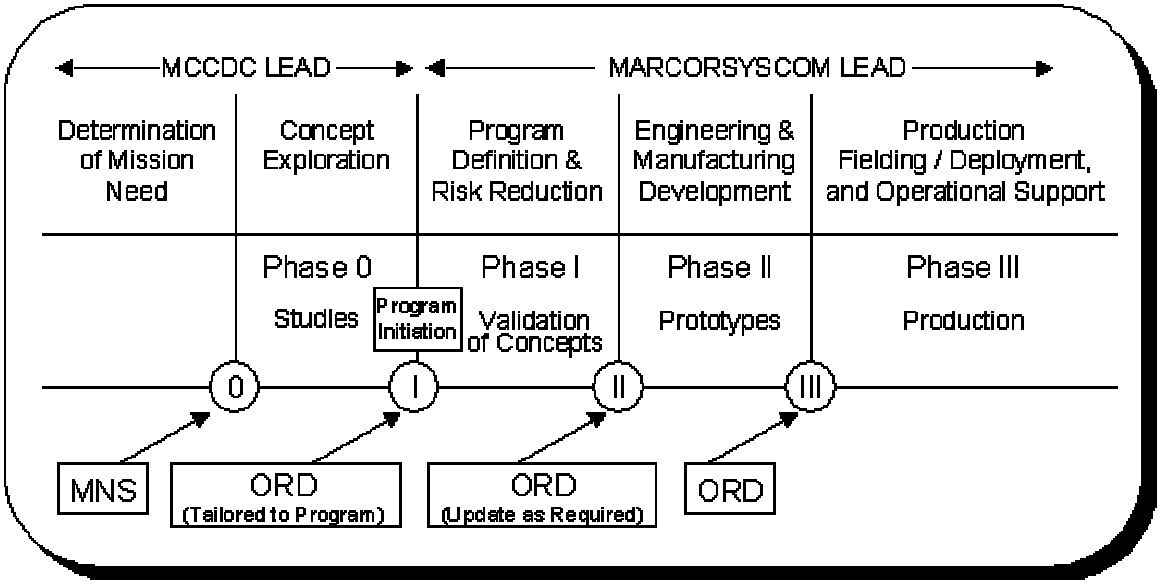

Figure 2-1. Acquisition Process-Overview (based upon 1996 DoD 5000.2)

Once the draft MNS has been staffed and approved by the Assistant Commandant of the Marine Corps (ACMC), it is forwarded to the Milestone Decision Authority (MDA) for a Milestone 0 (MS0) "Determination of Mission Need" decision and the assignment of an Acquisition Category (ACAT). A listing of ACATs and the criteria for their assignment can be referenced in Appendix A. The ACAT is determined, program-by-program, based on the type of acquisition and its estimated lifecycle cost. Once an ACAT has been assigned by the MDA, the staff of MARCORSYSCOM conducts a preliminary program assessment and assigns a Program manager (PM), giving him or her guidance on the overall program. These actions precipitate the Concept Exploration (CE or Phase 0) of the acquisition program, and are known as pre-MS0 activities. Figure 2-1 shows the phases of the acquisition cycle, which officially begins with the Concept Exploration (CE) phase, as well as which Marine Corps activity takes the lead in each phase. A more detailed description of the Acquisition Phases will follow.

1. Phase 0 of the Acquisition Cycle

Once a MNS has been approved by the appropriate MDA, the Concept Exploration Phase begins. The lead agency, in the case of the Marine Corps it is still MCCDC, will translate the operational requirements outlined in the MNS into an Operational Requirements Document, or ORD (see figure 2-2). The ORD will be in a standard format dictated by DoD 5000.2-R. It describes:

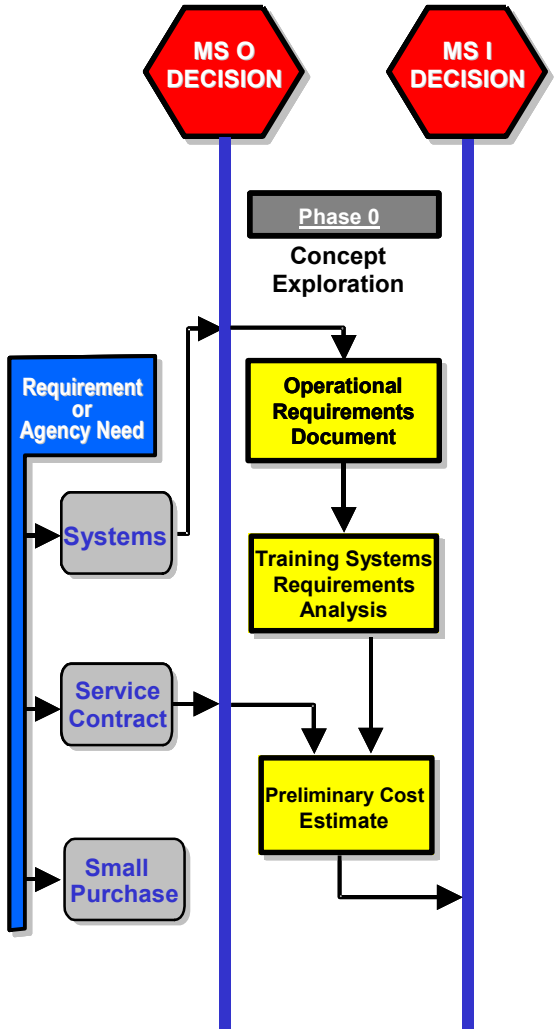

Figure 2-2. Phase 0 of the Acquisition Cycle

> "…the overall mission area, the type of system proposed and the anticipated operational and support concepts in sufficient detail for program and logistics support planning and includes a brief summary of the mission need." [4]

Before the MDA can make a Milesotone 1 (MS1) decision to move the program into Phase 1, several additional analyses and estimates will be conducted, including a Training Systems Requirements Analysis and a Preliminary Cost Estimate. Once the appropriate analyses have been performed the MDA can make the decision to formally initiate an Acquisition Program. This signifies that the mission needs outlined in the MNS, the operational requirements documented in the ORD, and the analyses and plans of the PM and working groups are sufficient.

2. Phase 1 and 2 of the Acquisition Cycle

The program begins Phase 1 after it receives MS1 approval to proceed. Phase 1 is known as the Program Definition and Risk Reduction (PDRR) Phase (ref. Figure 2-3).

[4] NAWCTSC Acquisition Guide

The Program Manager will form a series of working teams called Integrated Product Teams, or IPTs (discussed later in this chapter) to perform planning functions.

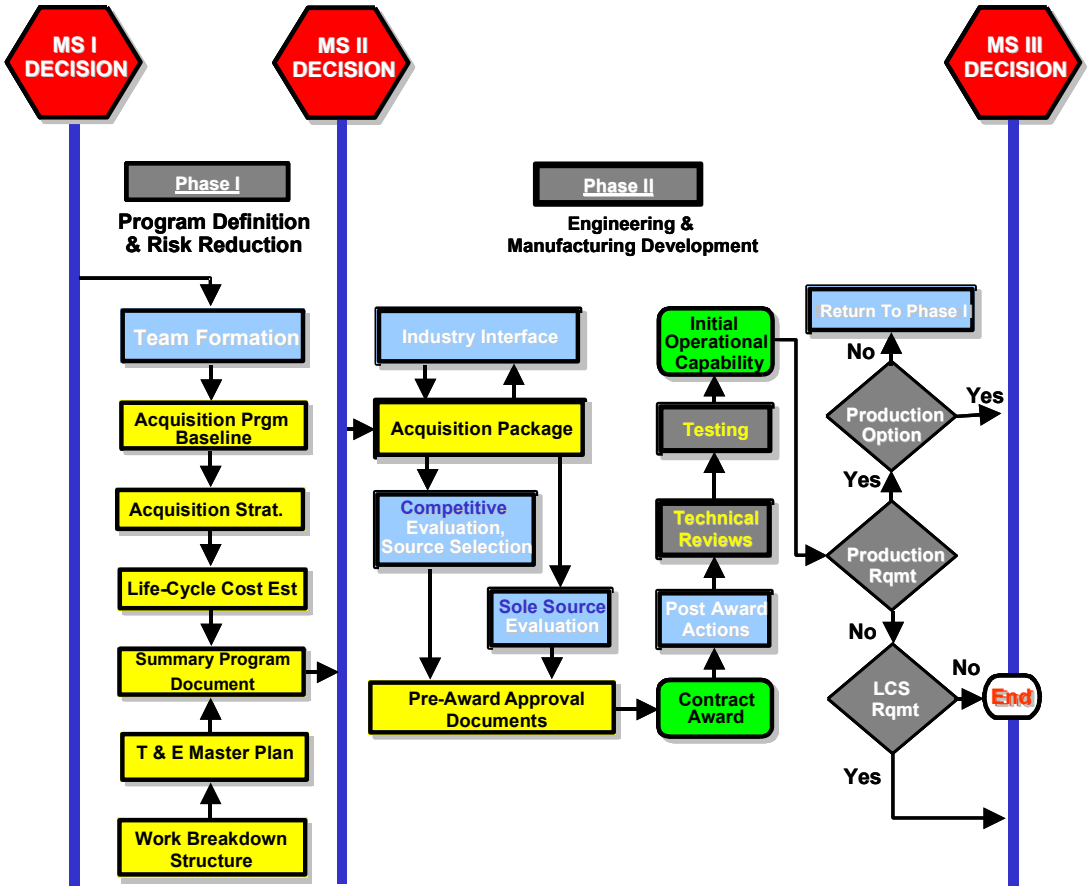

Figure 2-3. Phases 1 and 2 of the Acquisition Cycle

The IPTs produce three important documents during PDRR. The first is the Acquisition Program Baseline (APB), which outlines the overall cost, schedule, and performance goals, strategies, and milestones for the acquisition program. The second is called the WBS, or Work Breakdown Structure. The WBS was specifically developed by DoD to help manage acquisition programs. Military Standard 881B defines a WBS as:

> "…a product-oriented family tree composed of hardware, software, services, data and facilities.... [it] displays and defines the product(s) to be developed and/or produced and relates the elements of work to be accomplished to each other and to the end product(s)." [5]

Lastly, the teams will develop the third important Phase 1 document, a testing plan called the Test and Evaluation Master Plan (TEMP). The TEMP outlines how the PM will test

[5] Work Breakdown Structure

any components (may be software modules in AISs) and the end product, as well as the cost, schedule, and performance goals for testing. The IPTs will also create documents describing the tailored strategies that will be used during the rest of the acquisition process.

The IPTs' goal is to reduce the program's risk of failure by planning extensively the critical path it must follow in order be successful. The plans will probably be revised during later stages of the acquisition process as more is learned about the program itself, but are required pieces of information that will allow the MDA make a Milestone 2 (MSII) decision to pass the program into Phase 2, Engineering and Manufacturing Development (EMD).

The EMD Phase (ref. Figure 2-3) is where the capabilities required of the program's product will be explored. Prototypes will be constructed, sole-source or competitively bid contracts may be entered into with civilian contractors, and testing of the prototypes will be conducted (in accordance with the TEMP) to see if the capabilities outlined in the MNS have been achieved. The PM's major activities in this phase are related to project management. He/she will be supervising the writing and awarding of one or more contracts, then supervising the cost, schedule, and performance outcomes of the contractors in relation to the APB. The PM is required by law to report on the progress of his/her program during all phases of the acquisition cycle, but more so during EMD because that is traditionally where most of the development cost is incurred.

The EMD phase ends with the presentation to the MDA of documentation covering the performance of the prototype(s) as measured against the MNS and ORD. The MDA will make the decision at the end of EMD, known as the MS III decision, whether to continue the program and move into production, or to send the program back to Phase 1 for further planning and refinement.

3. Phase 3 of the Acquisition Cycle

If a program passes the MSIII decision point, it will enter the Production, Deployment & Operational Support phase, also known as PD/OS or Phase III. During this phase the program's product is produced and fielded to operational units. The PM will conduct (or hire a contractor to perform) acceptance testing, and will also begin

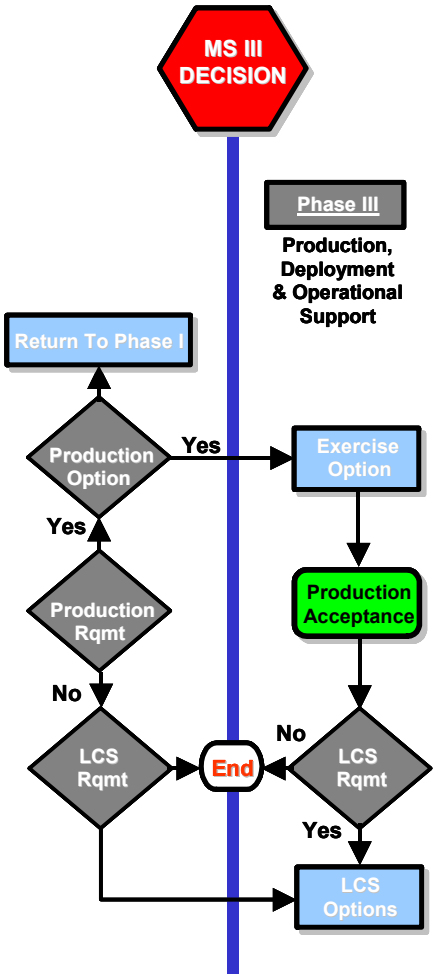

Figure 2-4. Phase 3 Activities

implementing plans for upgrades or revisions to the product, actions known as life cycle support or LCS (ref. Figure 2-4). Phase III plans (outlined in the APB) will cover the product to the end of its active life cycle, which can last for decades in some cases. Once the program's product has been fielded and is no longer being produced or upgraded, management of the asset(s) is turned over to the logistical agencies resident in the Marine Corps or the MARCORSYSCOM. That agency or department handles the product until the end of its active service.

It is worth noting that the development of IT products via the standard Acquisition Cycle doesn't differ significantly from the acquisition of non-IT material. The main differences between the two involve the reporting and decision-making (i.e. MDA) bodies and/or individuals. In most cases PMs are allowed the freedom to tailor their IT acquisition programs to reflect the intellectual and developmental differences between IT acquisitions and material acquisitions (sometimes one and the same).

B. PROGRAM FUNDING

Planning and funding for acquisition programs begins after valid requirements have been identified and a material solution is sought to fulfill them. As with all DoD Agencies and the other Services, Marine Corps acquisition programs are funded with money assigned in the Congressionally-approved DoD Budget. As part of the Planning, Programming, and Budgeting System (PPBS), the services submit to Congress (through DoD) their list of proposed programs and the schedule for funding them. The overall programmatic budget is referred to as the Future Years Defense Plan, or FYDP. The FYDP is

> "… a database that summarizes all resources, over an eleven-year period, associated with programs approved by the SECDEF for the DoD. The FYDP is the vehicle that allows DoD to take a multi-year focus for resource allocation…"[6]

Individual programs are assigned one or two-year budgets based upon what type of funding they are using to accomplish their mission. Monies are approved by Congress in the form of Appropriations, which provide authority for Federal agencies to incur obligations and make payments for specified purposes out of the treasury. For its acquisition programs, the Marine Corps budgets from its Research, Development, Testing & Evaluation (RDT&E), Procurement Marine Corps (PMC), and Procurement of Ammunition, Navy and Marine Corps (PANMC) accounts.

The significance of funding for programs cannot be emphasized enough, because within the Services' budgets for acquisition, there is in most cases competition between programs for money. The Secretary of Defense and the Service Secretaries are afforded a certain amount of freedom to re-direct funds they have been budgeted. That freedom is necessary in order to cover cost overruns that some programs incur, as well as to allow the Secretaries to establish and rearrange priorities within their departments. Funding is also important because the PPBS works in a two-year cycle that forces the Services to reanalyze their programs' necessity, and since very few acquisition programs are completed within that timeframe, the managerial overhead associated with planning, budgeting, and tracking expenses is quite high.

C. MANAGERIAL ISSUES

The management of an acquisition program involves, to a large extent, the planning, tracking, and supervision of three competing objectives: cost, schedule, and performance. Of the three, cost is usually the most important variable, and the concept of Cost as an Independent Variable (CAIV) is taught, preached, and stressed to all participants in the acquisition process. Deciding to make trade-offs by sacrificing one or two variables to optimize the third is an accepted part of acquisition process.

Within the structure of the Acquisition Cycle as it is outlined in DoD 5000.1 and 5000.2, Program Managers are afforded (and directed to exercise) the freedom to tailor

[6] US Navy N-6 PPBS Tutorial

their managerial practices to fit the needs of their acquisition program. This relative freedom is necessary because it is understood that there is no single best way to construct an acquisition program so that it accomplishes the objectives of the Defense Acquisition System. To help accomplish those myriad objectives, the process of Tailoring can be applied to

> "…various aspects of the acquisition system, including program documentation, acquisition phases, the timing and scope of decision reviews, and decision levels."[7]

To increase the proficiency and professionalism of the acquisition workforce (as well as logistics and technology communities), DoD 5000.1, Section 4.5.6 directs the Department of Defense to establish training, education, and experience standards for each managerial level involved in the acquisition process. The establishment of professional training and education standards was mandated by the Defense Acquisition Workforce Improvement Act (DAWIA), which

> "…requires the Secretary of Defense, acting through the Under Secretary of Defense (Acquisition & Technology), to establish education and training standards, requirements, and courses for the civilian and military acquisition workforce."[8]

In addition to tailoring, another managerial concept/practice is central to the acquisition process, a concept called Integrated Product and Process Development (IPPD). The DoD defines IPPD as,

> "A management process that integrates all activities from product concept through production/field support, using a multifunctional team, to simultaneously optimize the product and its manufacturing and sustainment processes to meet cost and performance objectives." IPPD evolved from concurrent engineering, and is sometimes called integrated product development (IPD). It is a systems-engineering process integrated with sound business practices and common sense decision-making. One of the key tenets of IPPD is that of multidisciplinary teamwork via Integrated Product Teams (IPTs)."[9]

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[7] DoD 5000.1, Section 4.5.1

[8] Defense Acquisition Workforce Improvement Act

[9] IPPD/IPT; US Navy Acquisition Reform Website

The use of IPTs is a teamwork approach to implementing IPPD whose goal is to make the right decision at the right time. The IPTs themselves are composed of functional representatives from appropriate disciplines, brought together as necessary to identify and resolve issues, make sound and timely decisions, and build successful and balanced programs. Team members are expected to accept team input and make team decisions, putting the needs of the respective program ahead of their organizations' interests when assigned to an IPT. Since they are stakeholders in the acquisition process, many IPTs will include contractors, suppliers and customers.

Section 7.6 of DoD 5000.2-R outlines the formation of and duties expected from IPTs for high-level and/or high-cost programs. Component Acquisition Executives (CAEs) are afforded the flexibility to tailor IPTs for programs not assigned ACAT ID or IAM that fall under their cognizance (ref. Appendix A for ACAT categories).

Teams are formed according to their function they are expected to perform. For example, executive decision-makers may be included in an Overarching IPT (OIPT), which is formed whenever a department intends to start an acquisition program. OIPTs are the charter organization of all subordinate teams. Normal IPTs are referred to as Working-level IPTs (WIPT). If the acquisition program involves the integration of parts, software modules, or any other numerous or complicated components, an Integration IPT (IIPT) may be formed, although it is considered a type of WIPT. When a cost/performance/schedule trade-off is necessitated, a Cost/Performance IPT (CPIPT) will convene.

D. CONCLUSION

The formal acquisition process is guided very specifically by DoD 5000.1 and DoD 5000.2-R. Those two documents outline a structured process that is divided into specific phases, which are separated by milestone decision points. Law in most cases requires program Managers to submit periodic reports and detailed documentation concerning their programs to an OIPT and/or their CAE.

Acquisition programs are funded from a variety of DoD allocations, all of which must be periodically reviewed via the PPBS, which forces services to re-justify their acquisitions every year. Management tools mandated to PMs to help manage their

programs include Tailoring and IPPD. Both encourage PMs to streamline the traditionally time-intensive acquisition process when applying it to their individual program.

III. THE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION

The ACTD process was conceived as a response to problems within the acquisition system. The complex cycle, with its many levels of oversight and approval, created a series of problems, notably mentioned in the Packard Commission's 1986 report A Formula for Action:

> "A serious result of this management environment is an unreasonably long acquisition cycle – ten to fifteen years for our major weapon systems. It is a central problem from which most other acquisition problems stem:
>
> - It leads to unnecessarily high cost of development
>
> - It leads to obsolete technology in our fielded equipment
>
> - And it aggravates the very gold plating that is one of its causes …"[10]

The ACTD program was initiated in early 1994 as a response to these problems, and was designed to speed the transition of technology to military users. The focus of ACTDs is not on technology development, but on evaluation and incorporation. The goal "…is to provide a prototype capability to the warfighter and to support him in the evaluation of that capability."[11] ACTDs are considered pre-acquisition activities, a sort of low-cost way of assessing the risks and uncertainties associated with technological projects before the technology becomes incorporated into a formal acquisition program.

The ACTD process is designed to quickly respond to an urgent military need by employing available, *mature* technologies. The procedural design is considerably more focused than the standard acquisition process, applying solely to technology and it's application to real-life needs. The Undersecretary of Defense for Acquisition, Technology, and Logistics (USD A&T) website includes a very concise summation:

> "Under ACTDs, systems are designed, fabricated, and then demonstrated in realistic combat exercises to gain an understanding of the military utility of the system, to support development of the associated concept of

[10] Cycle Time Reduction – Notable Quotes; http://www.acq-ref.navy.mil/ctrquotes.html

[11] Introduction to ACTDs; http://www.acq.osd.mil/actd/intro.htm

operations, and to place a limited but demonstrated capability into the hands of the warfighter at the conclusion of the ACTD. When additional quantities or capabilities are required to meet the full military requirement, the system enters the acquisition process at the point that is appropriate given the level of developmental maturity."[12]

Ten ACTDs were initiated during 1995, the first year after the process was authorized, and their numbers have been increasing yearly, as shown in Table 1.

Table 1: Selected Yearly Total ACTDs

Calendar Year	Cumulative Total ACTDs
1995	10
1998	46
1999	57
2000	69
2001	83

Most recently, sixty potential ACTDs were proposed for fiscal year 2001.

A. CANDIDATE FORMULATION AND SELECTION PHASE

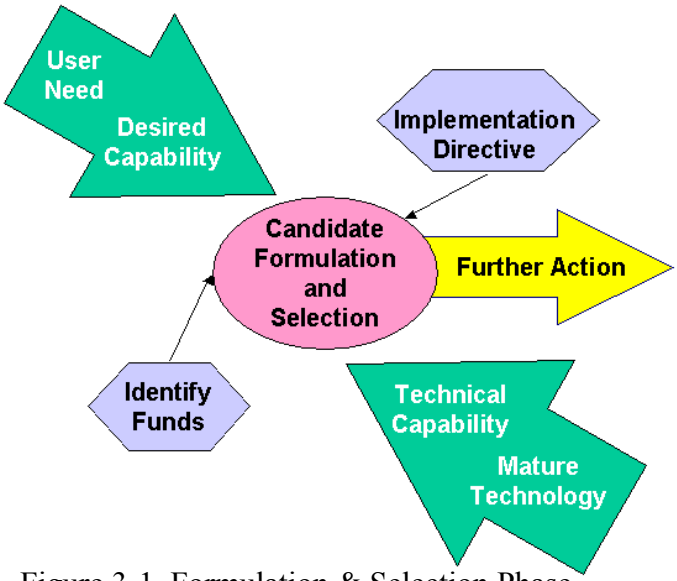

Figure 3-1. Formulation & Selection Phase

Early in the first quarter of each fiscal year, an invitation is extended from the Deputy Undersecretary of Defense for Advanced Systems and Concepts (DUSD AS&C) to the Unified Commands, Services, and Defense Agencies. The invitation is for new ACTD proposals, which are due the following January. Since

[12] DoD Guide to IPPD; www.acq.osd.mil/io/se/ippd/guide/acquisition.html

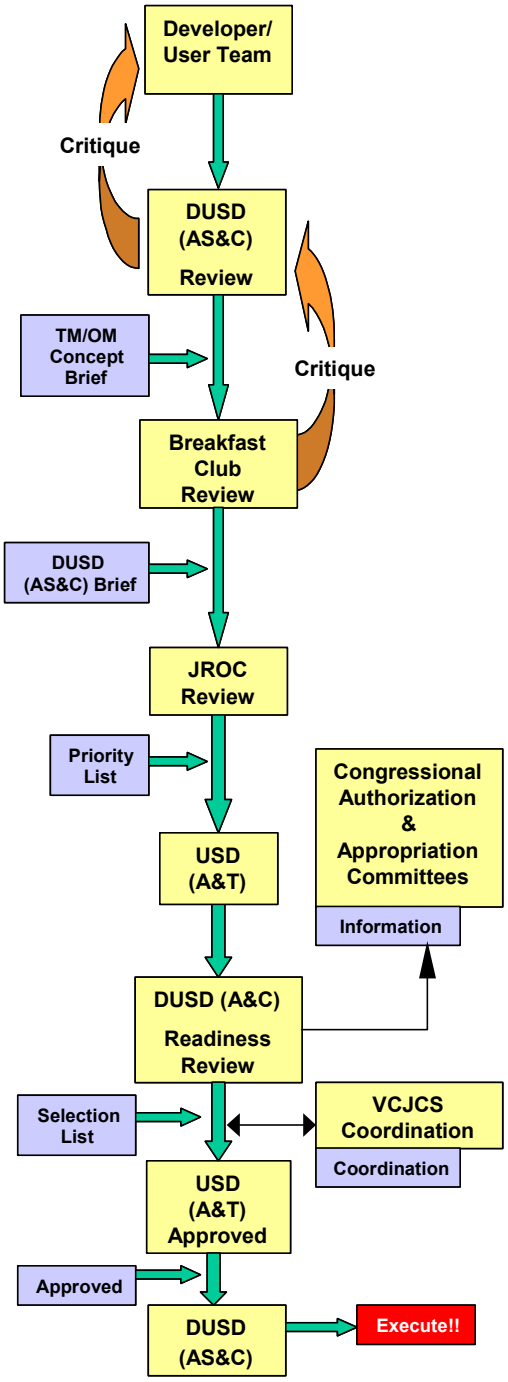

Figure 3-2. Selection Review Process

the invitation is addressed to the executive level, laboratories and individual warfighting units are not extended invitations, so must inform their chain of command of any desire to submit a proposal.

ACTDs can be initiated from several directions: requirements pull and technology push (ref. Figure 3-1). The occasion for requirements pull would be when an operational unit identifies a critical military requirement up its chain of command, which then responds to the ACTD invitation by submitting a proposal. Technology push, on the other hand, occurs when a defense lab or civilian organization identifies an emerging (but still mature) technology that can possibly provide military utility. Either way, with the ACTD selection process, special effort is given to let warfighters decide which needs receive the highest priority and thus funding. In the lexicon of ACTDs, technologists are called Technical Managers (TM), and warfighters are referred to as Operational Managers (OM). In all cases, close cooperation between the two is highly encouraged since it increases the chances not only of a proposal being accepted as an ACTD, but also the chances of the ACTD coming to a successful conclusion.

Once proposals are received by the DUSD (AS&C), a series of briefings to OSD, Service, and Joint Staff representatives takes place (ref. Figure 3-2), as well as presentations to Congressional committees. During the candidate formulation and

selection phase, the TM and OM work on refining their proposal and the myriad plans it entails, in effect pre-planning their ACTD. They also work to secure funding sources and try to gain the support of/sell their proposal to the user community who stands to benefit from their project. The stages of review work as a filtering process, wherein the level of detail required and criticality of the reviewers increases in each stage. For example, during fiscal year 2001, sixty proposed ACTDs were reduced in number to 25 before being reviewed by the Joint Requirements Oversight Council (JROC). After the JROC review, the candidate ACTDs on the prioritized list will have their plans reviewed by the OSD, and will have them presented to several Congressional committees. Factors that can de-rail candidate ACTDs during the final stages of review include funding. For example, after the 25 previously mentioned 2001 ACTD candidates were reviewed for funding, only 14 passed muster. The final portion of the formulation and selection phase is the presentation of the Selection List to the USD (A&T), whose signature gives approval to execute proposed ACTDs. That signature will be placed upon the first important document in the ACTD process, the Implementation Directive (ID).

According to the ACTD Manager's Guide, the ID:

> "…clarifies the roles and responsibilities of all the parties involved in ACTD execution. It is intended to provide unambiguous top level guidance prior to approval of the ACTD. This two or three page document is prepared by the proposing developer and user. It defines the operational capability to be demonstrated, general approach, participating agencies, transition path(s), and approximate funding and schedule."[13]

It is, in effect, a capstone document that summarizes proposed ACTD actions prior to its approval. The approved ACTD IDs are signed after Congress approves the Defense budget, and will also be signed, as a basic 'contract', by senior three-star-level executives from all participating agencies.

B. MIDDLE PHASE OF ACTD LIFECYCLE

The time taken from the USD (A&T) invitation for ACTDs to his/her signature on the approved IDs is usually less than a year. In comparison, the middle phase, where the bulk of energy and money is spent, typically lasts two to four years.

[13] ACTD Manager's Guide

Once a candidate ACTDs ID has been signed by the USD (A&T), the focus of the TM/OM team becomes the Management Plan (MP). In fact, the ID – the 'What' of the ACTD - must include a statement directing timely completion of the MP – the 'How' of the ACTD'. The MP is drafted for two purposes: as a baseline management document for the ACTDs Oversight Group (its OIPT) and as a management tool to be used by the TM, OM, and Transition Manager (XM). Much of the information included in the MP can be transferred directly from the ID. The ACTD process is designed to provide:

> "…flexibility and avoidance of excessive rigidity/formality in documentation and process. Hence, the MP is intended to be an executive-level document (ideally, less than 25 pages) written in informal language."[14]

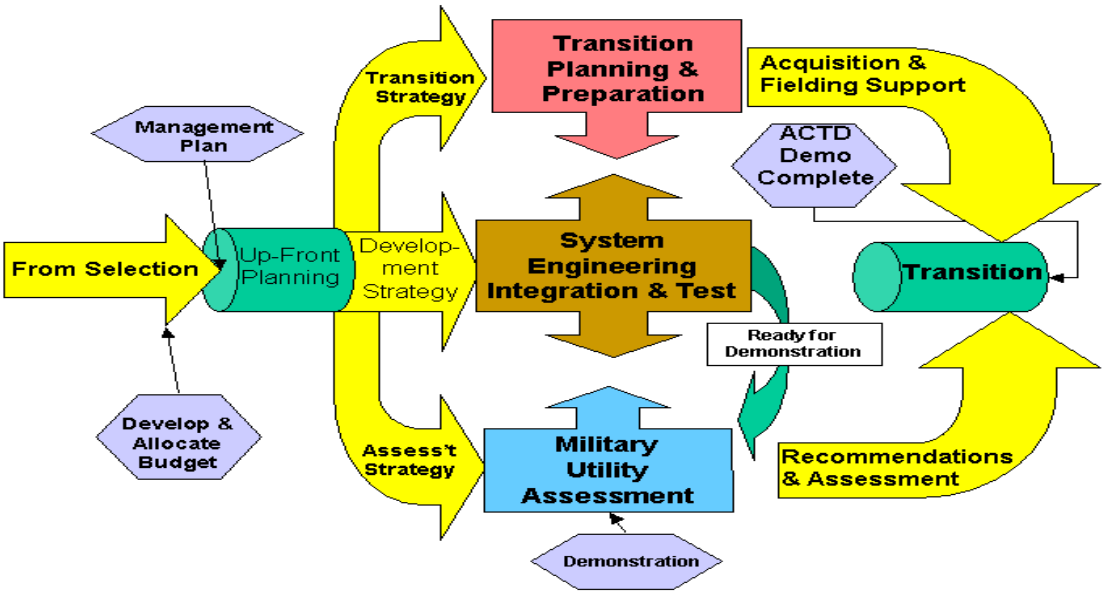

Figure 3-3. Middle Phase of ACTD Lifecycle

The TM, OM, and XM designees will usually draft the MP, with assistance from other participants in the process, and officials at the one-star level will sign it. The MP is due to the DUSD (AS&C) for his/her signature 90 days after an ACTD is approved, so it is incumbent upon a demonstration's managers to begin drafting it during the formulation and selection phase.

[14]ACTD Manager's Guide

There are three interdependent activities (see figure 3-3) that must take place during the middle phase of an ACTD: Transition Planning & Preparation (TPP), System Engineering Integration & Testing (SEI&T), and Military Utility Assessment (MUA). All three activities are completed with the combined efforts of the TM, XM, and OM but each individual manager will take the lead in his/her respective specialty.

1. Transition Planning and Preparation

An ACTDs ID will identify a Lead Service to spearhead the demonstration's management. The XM is usually assigned by a Lead Service acquisition agency, and as the title implies, transition planning is his/her responsibility. The XM will use the MP as a baseline to begin up-front planning for several possible outcomes of an ACTD transition decision, even though that decision won't be made until the end of MUA. The TPP activity:

> "…addresses two aspects of fielding the ACTD capability. The first deals with fielding the residual ACTD capability to provide an immediate operational capability in a limited deployment. The second deals with replicating the capability to provide for much wider deployment. This requires the ACTD to transition to a formal acquisition program."[15]

Both fielding of the ACTD residual and planning for a formal transition require extensive planning, and to accomplish transition planning correctly, the XM will often include experts in areas like acquisition, software support/training, logistics, and contracting in IPTs to assist with the planning function.

The XM's transition plans are staffed to the Oversight Committee, as well as the TM and OM, well before a transition decision is made concerning the ACTD. The XM will include representatives from potential acquiring organizations (like MARCORSYSCOM) in his/her transition planning since, if a wider-deployment decision is made, all the advanced planning will allow such a decision to be implemented with a minimum of delay and little loss of programmatic momentum.

[15] ACTD Manager's Guide

2. System Engineering Integration & Test

The objective of the SEI&T activities is to integrate already-developed, mature technologies:

> "…by means of system engineering and system integration to create a desired technical capability which, when combined with appropriate CONOPS [Concept of Operations] results in a new or improved military capability. Testing is required to characterize system performance and verify everything is working before demonstrating the system in an operational environment."[16]

Success during the SEI&T stage of an ACTD requires effort and expertise from professionals in areas such as project management, engineering, and information technology. The TM, who takes the lead in the SEI&T activity, must have some skill level in all these areas as well as others not listed, and will attempt throughout SEI&T to keep the focus of all participants on developing military utility.

Much of the SEI&T planning, like TPP, will take place before the MP is approved. This is necessary in order to gather and involve necessary expertise, as well as plan and perform the SEI&T activities, while still meeting the compressed timeline of the ACTD process. Several examples of areas needing up-front planning are contract management, contractor identification, scope/definition of the system, and budgeting for SEI&T activities. In many cases, ACTD managers rely on a Work Breakdown Structure (or something closely resembling a WBS) to help plan their activities, even though the ACTD process does not require it.

The jobs of the TM and OM during SEI&T closely mirror the activities of an acquisition PM during the EMD phase of a formal acquisition program – tracking cost, schedule, and performance. As previously mentioned, strong project management skills are a must to successfully make the ACTDs system ready for its MUA, demonstration, and transition. The TM/OM activities during this stage of the ACTDs lifecycle will directly support efforts of the XM for the ACTDs transition. For example, the affordability of demonstration systems and their support (logistics, personnel, and documentation) must be planned for and executed in order to make the system 'sell' to

[16] ACTD Manager's Guide

operational users (and acquisition commands) at the conclusion of the ACTD. To be successful during SEI&T, the TM and OM need to

> "…implement a balanced system engineering and testing approach that qualifies the system to enter LRIP without *encumbering the ACTD with the extensive process and paperwork that has evolved under formal acquisition procedures.*"[17] (Italics added)

Extensive user participation in the SEI&T effort is encouraged, and will be coordinated with and by the OM. This encourages feedback between the SEI&T and TPP processes, and hence increases the chances of concluding a successful ACTD.

A Demonstration Readiness Review (DRR) concludes the SEI&T phase. The DRR is needed because:

> "It is extremely important to confirm dependable system operation before committing to a field demonstration event such as an exercise that includes large numbers of operations and planning personnel. There should be no need to trouble shoot either individual equipment malfunctions or subsystem interfaces in the field where time and resource pressures are severe. "[18]

The DRR includes an end-to-end system test to ensure reliable operation of the system, as well as its subsystems and support personnel/operators. Test performance of the system is usually characterized by minimum and maximum expected functionality. That characterization will influence the assessment of the actual demonstration, overall transitional activities, and the final CONOPS produced by the ACTD managers. Also, various activities, such as the drafting and approval of Interoperability Assessments, Environmental Impact Statements, and Safety Certifications must be taken care of before a real-life demonstration.

3. Military Utility Assessment

The MUA is the heart of the ACTD process since its primary goal is to evaluate technological contributions to military capability. According to the ACTD Manager's Guide, an MUA:

> "… is a judgment of the military worth of a proposed capability. The assessment is performed by evaluating performance measured in an

[17] ACTD Manager's Guide

[18] ACTD Manager's Guide

> operationally realistic environment against critical operational issues. The assessment considers operational effectiveness and suitability in performing the assigned mission (can it do the job?) and overall importance to the success of military operations (so what?) in judging military worth."[19]

An MUA is performed by warfighters and coordinated principally by the OM, in keeping with the operational focus of ACTDs. Effectiveness and aptness requires testing in an operation, for which purpose the ACTD managers will either plan an operation for their purpose or piggyback on an existing operation. One or more operations in which the ACTD system is demonstrated are used to collect data, which will then be evaluated to determine military utility.

The results of a MUA can range from a determination that the ACTD technology provides significant utility to a conclusion that it has no utility. In either case, a successful MUA will provide a conclusion that can withstand serious analyses. A parallel can be drawn to the Operational Tests that are run on products of the acquisition cycle during its EMD phase, but without the rigor and formality.

As with TPP and SEI&T, a significant amount of preplanning is required of the OM, who will get assistance from and coordinate with the XM and TM. Since an MUA can be a major undertaking involving multiple services, defense agencies/organizations, and possibly foreign participants, the job of OM is extremely vital for MUA to not only occur, but also succeed. The OM's major duties in relation to the ACTD involve planning for, conducting, and reporting upon the MUA. He/she is also the provider and coordinator of user participation in the SEI&T process.

The OM will use many military-style planning skills in the conduct of his/her duties, which begin before the ID is approved with preplanning. The OM of an ACTD will prepare a plan, called an Assessment Plan, outlining the cost, schedule, and performance outcomes of the MUA (which may be a process unto itself). As with the TM, a WBS-like work structure can be constructed to help guide the OM's planning activities. There are no formal reporting requirements in the ACTD process regarding the Assessment Plan, but approval by the User Sponsor – the organization that assigns the

[19] ACTD Manager's Guide

OM – is usually required, as are briefings and updates to the Oversight Group. The Assessment Plan is intended to be a 'living' document, updated as the ACTD matures.

As previously mentioned, the MUA will involve at least one operational demonstration. The TM, OM, and XM to update their plans as appropriate, will use the results of and data collected from demonstrations. The MUA will conclude with the submittal of an Assessment Report (AR) to the Oversight Group and the User, Technical, and Transitional Sponsors. The AR will provide substantiated conclusions regarding the military capability (or lack thereof) provided by the ACTDs system. The results of the report will form the basis of the true MUA output: the Transition Recommendation.

C. TRANSITION PHASE OF ACTD LIFECYCLE

Following completion of the AR, the ACTD will enter its transition. The possible outcomes of the Transition Decision are planned for during the middle phase of the lifecycle (and previously explained in section B-1) are:

1. Transition to a formal acquisition program and field residual system(s)
2. Field residual system(s) only
3. Terminate the ACTD

The decision to transition (to an acquisition) can be made during any period of the ACTD product's lifecycle. If such a decision is made within two years of the ACTDs completion and the residual is still in use, the ACTD managers will be responsible for the transfer of knowledge to the acquisition organization. If the decision is made after the two-year mark, the operational units using the residual will be responsible for transferring knowledge of the product to the acquisition agency. The OM will also participate in some transitional activities, such as planning for fielding of the residual capability, coordinating fielding requirements, and developing the ORD as needed. Close cooperation between all three managers (TM, OM, and XM) is, of course, required to make transition successful. These options, as well as the inputs to the Transition Decision/Phase can be viewed in Figure 3-4.

The managers of an ACTD will present the AR to the Oversight Group as well as the Lead Service for review. Smooth transition, no matter which conclusion is reached regarding transition, depends entirely upon prior planning. Transition, including fielding of residual capabilities, is the responsibility of the Lead Service, and will depend in large

part upon the skill of and working relationship between the OM and XM. The most stress-free outcome, of course, would be to terminate the ACTD, but even that decision can be a valuable one since it saves the spending of time and resources on technology that has no utility. The non-transitioned products can be returned to the defense lab or agency that owns them for possible further refinement, which may eventually provide utility

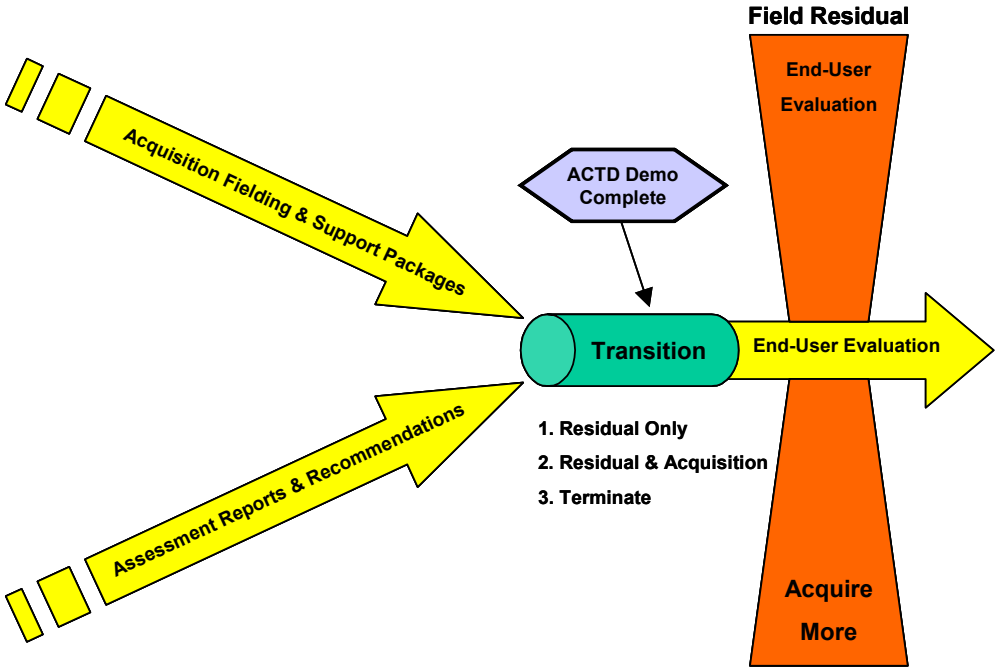

Figure 3-4. Transition Phase

If testing and evaluation of the ACTD product demonstrates military utility, the residual products may be transferred to an operational organization. That transfer will provide information back to the ACTD managers in the form of Extended User Evaluation (EUE). The cost to the ACTD of EUE is funding two years of technical, engineering, and sustaining support of their product at the operational unit(s). If military utility has been demonstrated and a wider deployment is needed, the XM will execute plans to transition the ACTD into an acquisition program.

D. ACTD FUNDING

Unlike formal acquisition programs, which must be funded from within the PPBS, ACTDs solely rely upon R&D funds to accomplish their mission. For most ACTDs, about 10% of the total cost is covered by funds from the DUSD (AS&C). The OSD supplemental funding:

> " …is for (1) integration of the technologies with existing systems for the demonstration, (2) providing multiple copies of system elements where that is critical to the user's evaluation of military utility, and (3) technical support of the residual capability, during which time the user will continue to evaluate the concept during routine training activities and will continue to mature the concepts of operation. Proposals for OSD funding should be coordinated with ODUSD/AT during the formulation phase."[20]

The R&D funds, which must cover the other 90% of an ACTDs total cost, usually come from technology programs such as defense labs and research agencies.

To better understand R&D funding, it may be useful to explain how R&D funds are allocated to the services. On a yearly basis, the R&D budgets of the respective services stay relatively constant as compared to procurement funding. This is in large part due to the fact that R&D funding requests are not subjected to the PPBS. This allows the services to plan their R&D spending on a relatively stable basis. The Science &Technology (S&T) budgets of agencies like the Defense Advanced Research Program Agency (DARPA), and the Office of Naval Research (ONR) are composed, in large part, of R&D funds transferred from the services. The spending of R&D funds is monitored by mandating spending according to a few categorical definitions, which are listed in Table 2-2. Funding for ACTDs falls at or above the 6.3 category since ACTDs are based upon mature technology.

Just because funding for the ACTD itself comes from R&D doesn't mean that the managers can ignore the PPBS and POM (Program Objectives Memorandum) however. Since one of the goals of ACTDs is to possibly transition into an acquisition system, certain events within the ACTD process can be timed to facilitate that possible outcome.

> "Funding for follow-on acquisition must, at some point, be included in the Lead Service POM. Scheduling MUA to provide emerging results at critical points during the POM cycle will provide added justification for essential programming and budgeting actions."[21]

This sort of scheduling will be included in the preplanning activities of both the XM and OM, with assistance from a Lead Service acquisition agency.

Table 2: Technology Readiness Levels and Their Definitions [from DoD 5000.2-R f]

[20] ACTD Guidelines: Formulation, Selection, and Initiation

[21] ACTD Manager's Guide

Technology Readiness Level	Description
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in a laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond the breadboard tested for level 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment.	Prototype near or at planned operational system. Represents a major step up from level 6, requiring the demonstration of an actual system prototype in an operational environment. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this level represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation.

E. ACTD MANAGEMENT ISSUES

The management of an ACTD has many program-management related activities in common with formal acquisitions. For example, both are encouraged to use IPPD to

their advantage, both allow and encouraged tailoring of reporting and documentation requirements to specific needs, and both require skilled management. Past those commonalities, the differences end.

An ACTD is essentially run by its DUSD (A&T)-assigned and JROC-recommended Lead Agency, which usually provides an ACTDs OM and XM. The TM is usually assigned from a technology lab. The fact that there are three co-equal managers, each responsible for interdependent ACTD activities, as well as reporting to different agencies, can present opportunities for conflict if all three don't work well together. It is essential to the success of the process that the goals and activities associated with the ACTD be made absolutely clear to each manager so they have a common focus.

From a managerial perspective, the ACTD process is designed to provide maximum flexibility, with minimal reporting and documentation requirements. To that end, only two procedural documents require executive-level review: the ID and the MP. Oversight of ACTD activities is taken care of by Oversight Groups, which typically meets every six months to review the ACTDs under their purview. For reporting purposes, the mangers submit monthly milestone/event achievement reports to the DUSD (AS&C).

F. CONCLUSION

The ACTD process is designed to rapidly incorporate mature technologies into operational units, with minimal reporting and documentation. The focus of all ACTDs is on warfighter requirements, and operational users are extensively involved in the ACTD process. ACTDs are assigned to a Lead Service during their first phase, Formulation and Selection. After an ACTDs ID has been signed, it has been approval to proceed into the second phase, which will be guided by an executively-approved MP.

An ACTDs managers are referred to as the OM, TM, and XM, and each will take the lead in one of three second-phase activities. Those interdependent activities, which occur simultaneously, are: TPP, SEI&T, MUA. The second phase concludes with one or more ACTD demonstrations, which are operational exercises. During the exercise(s), data will be collected which will help determine the military utility of an ACTD system.

Phase two ends when the OM submits an AR to the Lead Service decision authority. The ACTD will then enter its third phase, called the Transition Phase.

Once MUA has been completed, the Lead Service decision authority makes a transition decision. There are three options: fielding of ACTD residual to operational users and transition to an acquisition program, fielding of residual only, or termination of the ACTD. In the first two instances, the technology lab that developed the capability is responsible for fielding the residual product (including training, logistical support, and spare parts) for a period of two years.

ACTDs are funded with Research and Development monies, which fall under a different oversight process than the funds used for formal acquisition programs. That fact provides an advantage in that spending Research and Development funds involves less legal oversight and bureaucratic procedural overhead than does acquisition spending.

The management of an ACTD is complex since it involves not one but three managers. The managers will require many of the same skills as an acquisition Program Manager however, and rely upon some of the same precepts like Integrated Product and Product Management and Tailoring.

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IV. THE SMALL UNIT LOGISTICS ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION

A. PRE-ACTD SUL HISTORY

During his tour as Commandant of the Marine Corps, General Charles Krulak made a concerted effort to insert modern technological advances into Marine Corps tactics and techniques. To that end, in 1996 he initiated a five-year Advanced Warfighting Experiment (AWE), which was essentially an Advanced Technology Demonstration, or ATD. An ATD is similar to an Advanced Concept Technology Demonstration (ACTD) in form and function, varying in that ATDs are conducted to demonstrate technologic feasibility and maturity, whereas ACTDs deal only with mature technology. Also, ATDs are service-specific while ACTDs are joint endeavors.

To conduct the AWE, which was called Sea Dragon, a Special Purpose Marine Air-Ground Task Force was formed constituting 2000 active-duty Marines and sailors. The organization of any Marine Air-Ground Task Force (MAGTF) includes a Command Element, a Ground Combat Element, an Air Combat Element, and a Combat Service Support Element (CSSE). Sea Dragon's first operation was conducted in March 1997, with subsequent operations held all over the continental United States.

One of the areas that the Sea Dragon AWE focused upon was the application of technology to improve the command and control capabilities of Marine CSSE's. The need to manage the flow of supplies and services was identified because logisticians

> "…currently manage this flow manually, much as they have been doing since the inception of amphibious operations. Voice radio is still the primary means of communications, with hand carried information the primary back up. TAV [Total Asset Visibility] does not exist insofar as one person can communicate with all of the operational participants – again, manually. The staff planning and decision-making processes for commanders are still dependent on face-to-face communications and meetings, grease pencils, and flip charts."[22]

The Combat Service and Support (CSS) units participating in Sea Dragon developed a number of software applications, which they used to try and optimize the CSS provided

[22] Modernization for the Logistics Tactical Commander, pg. 1

to the Special-Purpose MAGTF. Those applications, and the improvements in CSS they attempted, gained the attention of the Office of Naval Research (ONR), which spent approximately $350,000 in Fiscal Year (FY) 97 contracting programmers to streamline their design and coding. The ONR also spent $1,000,000 in FY98, again in support of Sea Dragon-related logistical command and control (C2) software applications.

The logistics C2 applications were utilized with some success during Sea Dragon exercises, but what captured attention more than the software was the concept of using software and modern communications methods to speed Combat Service Support (CSS) to over-the-horizon combat units, an idea that had not been explored at the tactical level until Sea Dragon.

ONR support for the logistics software was significant for several reasons. The first is that ONR continued following and supporting progress over several years. A second reason is that the concept behind the applications was developed by and for the warfighters themselves, a key tenet of the ACTD process. The third is that ONR, through its technical support, came to the attention of Brigadier General Richard Kelly, the commander of 1st Force Service Support Group (1st FSSG), which conceived and built a handful of Sea Dragon CSS software applications. The thought that went into building and fielding those applications was the equivalent of requirements definition since the Marines had neither the time nor resources to invest in unneeded functionality.

B. SUL FORMULATION AND SELECTION PHASE

The afore-mentioned background is relevant in order to explain how The Small Unit Logistics (SUL) ACTD came about. In the case of SUL, the formal invitation issued by the DUSD (AS&C) was not what generated the ACTD. In the early summer of 1998, General Kelly attended a conference in Monterey California. While attending the conference, he had a chance to directly chat with the representatives from the Undersecretary of Defense (Acquisitions and Technology) USD (A&T). Their discussions crystallized the idea of initiating an ACTD to explore tactical CSS. General Kelly briefed the Breakfast Club later that summer and received favorable feedback. As important was a favorable recommendation from the Deputy Undersecretary of Defense for Advanced Systems and Concepts (DUSD AS&C) and the Program Manager, Information Systems (PM IS) at Marine Corps Systems Command

(MARCORSYSCOM). Following an abbreviated review process, the SUL ACTD was approved on 11 December 1998.

Quick approval can probably be attributed to several factors, namely that the USD (A&T) was already aware of the proposal, and that it involved a low relative cost: $3M over two years. The strength of the idea was also a bonus, since the ACTD would address a gap in current capability with technology while also providing an end-state Concept of Operations (CONOPS) for technology-enabled CSS command and control (C2).

When its Implementation Directive (ID) was signed, the key players in the SUL ACTD were:

- Operational Sponsor: Pacific Command
- Operational Manager (OM): 1st FSSG, which delegated responsibilities to Brigade Service Support Group 1 (BSSG-1)
- Technical Manager (TM): ONR
- Executive Agent: MARCORSYSCOM, delegated to PM IS
- U.S. Army: Joint participant with no resources contributed.
- Transition Manager (XM): PM-IS

The goals of the ACTD were:

> "…to demonstrate a "proof-of-concept" to improve logistics command and coordination [CC] in a joint environment, improve combat service support effectiveness and efficiency, and reduce the tactical unit logistics footprint."[23]

The ID also identified estimates of logistical improvements that would be realized as the utility of SUL was demonstrated. One the ACTDs targets was to achieve a 25% smaller logistical 'footprint', which refers to CSS units stockpiling potentially needed supplies. Another target was to reduce another key identifier of CSS performance, repair cycle time, by 40%.

C. SUL MIDDLE PHASE

1. Transition Planning & Preparation

Transition Management, although assigned to the PM IS, was actually handled by a Transition Integrated Product Team (TIPT) composed of three principal individuals. The first was a contractor (hired at ONR expense) who physically worked with the PM IS. The second was a Navy Science & Technology (S&T) professional assigned to work

[23] SUL C2 ACTD White Paper

transition issues (also physically at MARCORSYSCOM). The third was an ONR S&T engineer who worked closely with the TM.

The goal of SUL was to become an acquisition program, and the TIPT planned accordingly. Their idea was to closely mirror the documents required by the USMC Milestone III (MSIII) Milestone Decision Authority (MDA) to make his/her decision (whether to begin an acquisition program). The mirroring idea was necessitated by the fact that the DoD 5000 process specifies background documents (i.e. Testing Evaluation Master Plan (TEMP), Acquisition Program Baseline (APB), Mission Needs Statement (MNS), and Operational Requirements Document (ORD) in order for an MSIII decision to be made. The TIPT called their plan 'ghosting the 5000'. For example, whereas the formal acquisition process required a TEMP, the SUL transitional method called for a Design Assessment Master Plan, or DAMP, and where an APB was required, the SUL team used a Systems Engineering Master Plan (SEMP).

The goal of the TIPT was to create an environment conducive to a smooth transition of SUL to a MARCORSYSCOM-managed formal acquisition program. Planning for transition in the case of the SUL ACTD was made considerably easier because the end product of the demonstration was Government Off-the-Shelf (GOTS) software. Replication of GOTS software is as simple as making copies, putting those copies on compact disk (CD) media, and then distributing the CDs. Also, since two members of the TIPT worked at the Executive Agent's facility, they were able to closely coordinate the interface between the System Engineering Integration & Test (SEI&T) and Transition Planning and Preparation (TPP) processes.

2. System Engineering Integration & Test

The development plan for SUL called for spending the first four months of the ACTD in an 'architecture phase' wherein Sea Dragon logistical software modules would be integrated with theater-level Army C2 systems, communication links, and joint information systems. The goal of the architecture phase was to have an integrated developmental baseline (plan) by the end of the ACTDs first year. The second year was to be spent integrating web-based network security programs from the Defense Advanced Research Projects Agency (DARPA) and adding decision support functionality to the SUL product.

The SUL Management Plan (MP) wasn't signed until May of 1999. The SEI&T phase is a very management-intensive process, so for all practical purposes it didn't begin until the MP was approved via signature. The ACTD kicked off (in June) with a TM/OM meeting to define SUL data elements, information requirements, and information sources. Attending the meeting was the TM, her team from ONR, and a group of company-grade officers and Staff Non-Commissioned Officers (SNCOs) from 1st FSSG sent to represent the OM. The OM representatives sent to the kick-off meeting were working level managers like maintenance and supply officers, not commanders. Since they were sent to attend by the OM, the TM assumed that their input into the requirements definition of SUL reflected the needs of the OM. Unfortunately the input the TM received from the OM representatives reflected their working-level needs, which were significantly different than those needed by a CSS commander to make C2 decisions.

After the kickoff meeting, the first six months of the ACTD (June to December 1999) were spent in an architecture phase instead of four months as was originally planned, with the TM focusing efforts on the enhancement and integration of the logistical software modules identified by the OM representatives (managerial-level). As the architecture phase was coming to a close, the PM IS (as the MARCORSYSCOM-delegated executive agent) made a decision to focus the functionality of SUL on executive-level C2 rather than worker-level management. That decision effectively negated the previous six months of SEI&T effort since only one of the Sea Dragon modules involved C2.

After a proposal-solicitation process, a software-development contractor located in Los Angeles California was hired to build the SUL software. Since the operators of SUL (1st FSSG) were at Camp Pendleton in Southern California, location was a factor considered in the contracting process. To deal with a contractor so far away from both the executive agent and TM, a navy contract specialist from Port Hueneme CA was brought on to the SUL team.

The core of the SEI&T process was 'spiral development' (ref. Figure 4.1) of the SUL software, an approach agreed upon between the TM and the contractor. The spiral concept is a well-known form of software engineering wherein the design of a program becomes more specific as time progresses. The specificity with SUL was gained as the users (the OM and his representatives) clarified their requirements. The contractor was then expected to translate identified requirements into software functionality. To make the spiral process work, the TM scheduled a series of Requirements Implementation Processes (RIPs), meetings between the users and the contractor. The RIP meetings also had the added benefit of allowing the contractor to gain understanding of military culture. Three RIPs were conducted: September and November 1999, and January 2000.

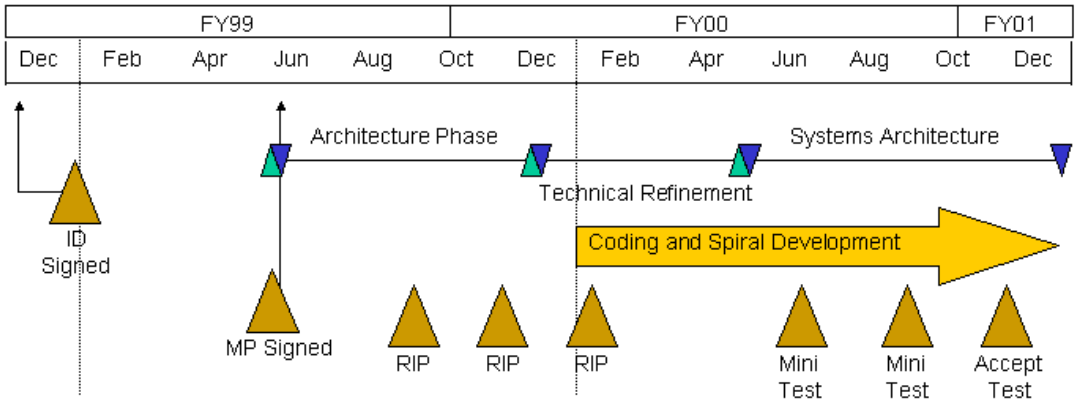

Figure 4-1. SUL SEI&T Activities

The actual coding of the SUL program began after the last RIP, and continued until an integration test was held in May 2000. From January until May, the contractor built a base-line system (with limited functionality) to use in the integration test, a brigade-sized exercise held at Twentynine Palms CA called Combined Arms Exercise (CAX) 5/6. The CSS unit for the exercise included all the OM-delegated managers that met in June 1999 as well as the OM himself, who was the CSSE Commanding Officer (CO).

During the integration test, a misunderstanding between the TM and OM developed, characterized later by the TM as an expectation management problem. SUL was used by the CSS element during the CAX, but the operators expected much more

functionality from the program than was scheduled to exist at that time. They expected to use a fully functional prototype application similar to what they had become accustomed to during Sea Dragon exercises. The CAX 5/6 test was directed by the TM however, who envisioned the CAX as a 'technical characterization'. The TM and OM had different expectations, and the end result of the misunderstanding was that the importance of the ACTD was downgraded in the eyes of the OM and his operators.

Because of the misunderstanding at CAX 5/6, as well as the receipt by the contractor and TM of additional requirements, the MUA demonstration of SUL was pushed back from September 2000 to December 2000. Originally, a later CAX was to be used for the SUL MUA demonstration, but the TM decided that the program (and the contractor) needed more time. CAX 5/6 also had several more unintended results. First, it made the TM very cautious of putting any sort of program prototype in the hands of the operators for fear that their expectations would be higher than what was practically realizable. Second, the operators became suspicious of the TM's ability to accurately translate their requirements to the contactor. The operators began a progress-damaging dialogue directly with the contractor regarding functionality enhancements, which risked voiding the contractor's contract and circumventing the TM's responsibilities. Testing of future SUL prototypes was conducted via Mini-Tests (ref. Figure 4-1) at the contractor's facility (using Marine operators) in June and September 2000, under the close supervision of TM representatives.

The SEI&T phase of the SUL ACTD effectively ended in mid-November 2000 with a TM-supervised and rigorously enforced government acceptance test. Since the TM had been working closely with both the TIPT and the executive agent, a draft ORD was presented to MARCORSYSCOM to assist with transition. The afore-mentioned acceptance test was conducted two weeks before the MUA demonstration, Exercise Desert Knight.

3. Military Utility Assessment

The MUA for the SUL ACTD was originally scheduled for two months after CAX 5/6, at another CAX (7/8). Because of the misunderstanding that occurred during the first CAX the MUA was pushed to the next exercise in which BSSG-1 would take part, which happened to be Desert Knight, scheduled for November and December 2000.

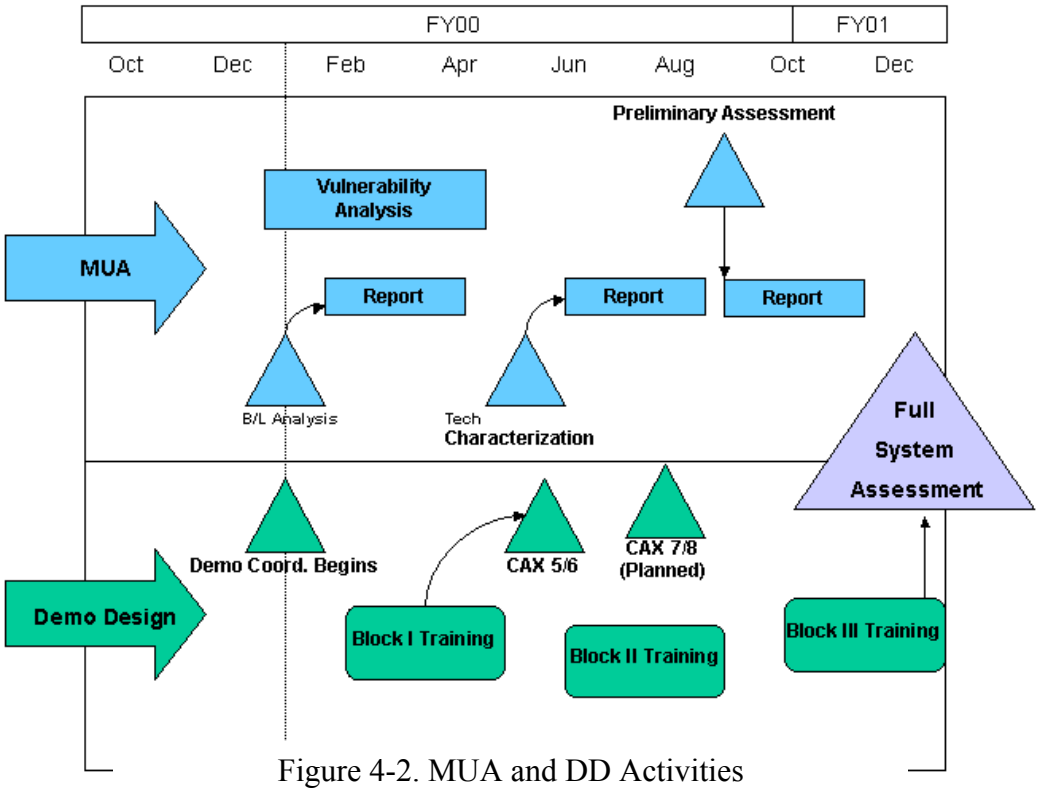

Figure 4-2. MUA and DD Activities

The same contractor as was hired for TPP planned the MUA with help from the Center for Naval Analysis (CNA). CNA's role in the MUA was the design and collection of statistics that, through analysis, could verify that SUL met its target metrics. The OM worked closely with a different contractor, Science Applications International Corporation (SAIC), to design the demonstration itself. The SUL Integrated Plan of Action & Milestones (POA&M) called for a Demonstration activity within the second phase of the ACTD, and activity on par with SEI&T, TPP, and MUA. The Demonstration Design (DD) activity (ref. Figure 4-2) included many actions normally associated with SEI&T as and MUA, but was deemed important enough to be classified as its own activity. Both MUA and DD were focused on preparation for SUL's final demonstration in December 2000. MUA planning concentrated on analyses of the SUL software itself, as well as the submittal of three reports to the OIPT. The DD focused upon the practical needs of a successful demonstration like people, training manuals, hardware, location of a suitable facility, and the communication links to be used. The SUL team referred to demonstration preparation as Block Training. Block Training was conducted before CAX 5/6, before the planned-for CAX 7/8, and before the final system assessment during Desert Knight.

The MUA itself took place from 3 to 10 December 2000 as planned. Coordination amongst the operators, the demonstration designer (SAIC), and the data collectors (CNA) was close, so the demonstration itself went off without a hitch. All concerned with the SUL ACTD waited for results from CNA, and anticipated what decision MARCORSYSCOM would make concerning transition.

D. TRANSITION PHASE

After Desert Knight, the PM IS decided to field the residual SUL product but not begin an acquisition program. That decision was reached not on the basis of SUL's merits as a CSS C2 software application, but on the lack of a Mission Needs Statement (MNS). An acquisition program within the Marine Corps must be based upon a MNS, and by the time the SUL ACTD was complete, none had been approved.

The lack of a MNS was a roadblock for SUL's smooth transition into an acquisition program at MARCORSYSCOM, but timing and funding were also problematic. Since the SUL ACTD demonstration occurred in Nov/Dec 2000, the first quarter of Fiscal Year (FY) 01, immediate MSIII acceptance of SUL would have meant MARCORSYSCOM had (on-hand) budgeted money to pay for production. That was a practical impossibility given how the Planning, Programming, and Budgeting System (PPBS) works: monies appropriated to MARCORSYSCOM in FY01 must have been planned for in FY99, when SUL was in its infancy. Because of the timing of SUL's approval and its lack of a budget line, MARCORSYSCOM couldn't fund further development until FY02 at the earliest.

Luckily for MARCORSYSCOM, fielding of residual GOTS software is extremely cheap since license fees aren't involved, and the SUL software was fully government-owned. Copies of the final version of SUL were distributed to all four Marine Force Service Support Groups. As described in Chapter 3, ONR is committed to supporting SUL for two years after the MUA, and is currently doing so.

Lastly, the PM IS and the Logistics sponsor at Headquarters Marine Corps (HQMC) decided against fully fielding SUL based on several technical roadblocks that were not resolved prior to the demonstration. A few of those factors were:

- SUL was based on Microsoft software architecture standards, which are different than those specified in the Defense Information Infrastructure/Common Operating Environment (DII/COE).
- SUL was the front end 'portal' of a back-end help-desk application developed by and for the Marines themselves during Sea Dragon. The two applications' interfaces were not well defined, and the two applications had different architectures.
- The back-end application was not written in a scalable, stable programming language, and since SUL relied upon its back-end for data, SUL itself wasn't scalable.
- The back-end, legacy, mainframe-based applications (and data) that SUL relied upon to perform its functions correctly did not allow dynamic, push-pull type updating, a problem that SUL identified but which wasn't solved before the ACTD concluded.

Issues like those identified above were based upon high-level requirements placed upon all DoD software applications targeted to service-wide or joint usage. In the case of SUL, two years of development was not enough time to 'work out all the bugs'.

E. FUNDING

The Expeditionary Logistics section at ONR, which has an approximate yearly budget of $24M, funded SUL. Year to year, the Navy is appropriated $1.4B for S&T programs. Of that amount, Expeditionary Logistics receives $20M, with another $4M coming from the Marine Corps' $55M S&T dollars. The SUL ACTD itself was budgeted $3M to be spread over two years. The bulk of that money was paid to the contractor developing SUL, with smaller amounts being paid to the on-staff contractor, SAIC, and CNA.

The money for SUL was 'locked in' by the participants' signatures on the ID, much the same as acquisition dollars are committed via budget lines. Freedom to tailor spending, in the case of SUL, was in the hands of the TM. As previously mentioned, contracts with civilian companies, as well as CNA, were handled from Port Hueneme. The on-staff contractor was paid directly by the TM. After the dust settled, the SUL ACTD met its spending goals and budgetary limits.

F. MANAGEMENT

None of the principle players in SUL had any experience with ACTDs before they took part in the SUL ACTD. Since most players were Marines, the fact that the Marine Corps had participated in only one ACTD prior to SUL played a part in its management. This inexperience relative to the other services was balanced, at least in part, by the involvement of ONR, which had a wealth of knowledge of R&D procedures, including ACTDs. The most significant occurrence regarding the management of SUL has already been discussed at length: the misunderstanding at CAX 5/6 between the operators and the technicians. That misunderstanding was a result of the Marines' lack of experience with ACTDs.

The relations between the TM, OM, and Executive Agent were the dynamics affecting the Management of SUL. The relative lack of knowledge regarding ACTDs on the Marines' part was amplified by the designation of an Executive Agent who specialized in DoD 5000-type procurement. Because of that experience, the PM IS was reluctant to field a 'good' answer, and seemed to want perfection. As well, it seems that the Executive Agent may have approached the ACTD process as a PM would an acquisition. For example, directing that SUL be a C2 system instead of a management system would normally be a TM decision. The PM IS was given latitude by both the OM and the TM since their goal was for SUL to become an acquisition… a decision likely to be made on the recommendation of the PM IS.

There were two OM's of the SUL ACTD: two successive commanders of BSSG-1. The first OM, as is the prerogative of Marine Colonels, delegated to his staff the management of SUL. Unfortunately, that delegation cost the ACTD and the LA-based contractor six months, or ¼ of the ACTDs funded lifecycle. Fortunately for the ACTD, a new Commanding Officer (CO) of BSSG-1 was assigned midway through its lifecycle, and the new CO/second OM took his responsibilities as OM personally. For example, the second OM ordered that SUL be used (even as a prototype) for all garrison CSS C2, not just for field exercises.

It is interesting to note that although a Transition Manager (XM) was assigned, transition planning was accomplished by a TIPT, none of whose members were at a

managerial level on par with the TM and OM. In fact, one person handled most transition planning activities, a contractor, and he was getting paid by (working for) the TM to handle transition issues and liaise with the PM IS on behalf of ONR. The management of transition activities for SUL is a good example of both tailoring and IPPD.

G. CONCLUSION

The Small Unit Logistics ACTD kicked off in late 1998 after an abbreviated selection process. It was funded by ONR, and managed jointly by MARCORSYCSOM, 1st FSSG, and ONR. After a slow start due to misdirected effort and some adjustments because of miscommunication, the participants in the ACTD spent 18 months doing their best to field a tactical logistics C2 capability to the Marine Corps.

When the final demonstration of SUL took place in December 2000, the Executive Agent decided against transitioning the ACTD into an acquisition program. Even though the managers' goal was ostensibly to become a formal acquisition program and that didn't happen, the SUL ACTD proved successful beyond its original scope.

What started as an idea to enable tactical CSS commanders to exercise C2 over their mission areas became much more. Despite its relatively meager funding level, and its failure to transition to an acquisition, the SUL ACTD accomplished the following:

- It raised awareness within the Marine Corps on the lack of C2 capabilities resident in tactical CSS elements, initiating a discussion that included articles published in the Marine Corps Gazette, an article written by the second OM/CO of BSSG-1.
- It highlighted gaps in technological capability that existed but had never been focused upon, and sparked follow-on actions on the part of ONR, MARCORSYCOM, and HQMC. Those will be explained shortly.
- The ACTD extended the life of the AWE-generated software modules, and provided a way for those applications to contribute to Marine-Corps-wide improvements in power projection and force lethality.
- The ACTD process gained visibility with the Marine Corps, the service that prior to SUL had only participated in one ACTD. If/when additional ACTDs are initiated by or participated in by Marines, they'll have a much better idea how to succeed based on lessons learned via SUL.
- In defining requirements for SUL, the Marine Corps gained a better understanding and definition of C2 as opposed to Command and Coordination (CC). Coordination in the context of SUL is internal awareness whereas control is external. A CSS commander needs both, and

the SUL ACTD helped clarify how much control and coordination a CSSE commander needs to accomplish his or her mission.

The gap in Marines' technological ability to exercise C2 over CSS elements raised eyebrows across the Marine Corps. Ideas that had been fomenting in the minds of Marine logisticians, including ideas generated as a result of the SUL ACTD, began to gather at Headquarters, Marine Corps (HQMC). Those ideas eventually generated action. For example, in the first three months of 2001, the following occurred:

- The Logistical Advocate at HQMC, a 3-star General, approved a Universal Needs Statement (UNS) for CSS C2. No longer would the lack of a MNS keep logistical C2 systems like SUL and its back-end from becoming acquisition programs. The UNS was signed on March 27, 2001.
- The increases in power projection and force lethality to be gained from a logistical C2 capability began to be understood. That understanding of possibilities sparked the publication of a Marine Corps Logistics Campaign Plan, released on January 1, 2001.

Possibly more significant than the UNS or the Logistics Campaign Plan was the conceptualization of possible changes in CSS doctrine. Those changes would be possible if tactical CSS C2 was a reality instead of a goal.

Even though the SUL ACTD didn't become an acquisition program, its CONOPS and ideas generated as a result of it goal of tactical CSS C2 made it successful at a higher level. This is not speculation but fact, evidenced by the fact that ONR, MARCORSYSCOM, and the logisticians from HQMC have initiated a new ACTD. The new program is called the "CSS Commander's Toolkit", and it includes SUL-like C2 software as well as sensors, data transmission requirements, architectural definition requirements, and CONOPS development. Participants in the new ACTD include the XM (contractor) from the SUL ACTD as well as the SUL TM and her principal assistant, both in expanded roles (the SUL TM as Program Manager and her assistant as the TM).

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V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The following conclusions reflect areas in which the experiences of the SUL Advance Concept Technology Demonstration (ACTD), as well as the standard ACTD process, can provide lessons applicable to the formal DoD 5000 acquisition process (ACQ).

1) User Involvement: The ACTD process includes a concept that exists conceptually in the ACQ process but is rarely present: user involvement. All ACTDs have Operational Managers (OMs), whose role is to provide constant user input into the development process. This core facet of ACTDs differs from the ACQ process, wherein users are included primarily in defining requirements, and are then consulted periodically (sometimes not at all) in formal-phase activities. The constant and active involvement of operators is an improvement over the DoD 5000 process.

The negative side of having increased user involvement was demonstrated very well by the experiences of the SUL ACTD managers. An OM may have considerable expertise in his or her functional area such as logistics, but little or no experience in Science & Technology (S&T) processes, practices, and procedures. Managerial problems arose with SUL partly because of the afore-mentioned inexperience and partly due to communication lapses between the managers. Having two to four co-equal managers of interdependent and simultaneous processes, as is the case with ACTDs, can be a recipe for disaster if the personalities of the managers clash or they fail to communicate clearly and constantly with each other. What ties them together is their goal of concluding a successful demonstration, but that may also be a trap if success is not clearly defined.

2) Reduced Oversight: Both the ACTD and DoD 5000 processes' managerial practices are based upon the tenets of tailoring and Integrated Product and Process Development (IPPD), but the ability to tailor either process is largely dependent upon the oversight placed upon managers. Since the ACTD process, even for a high-cost ACTD, mandates less oversight, the managers of an ACTD have more freedom to tailor than their counterparts in acquisitions, who are tied by law to certain reporting and oversight

levels. An excellent example of tailoring was exhibited in the SUL ACTD in that the managers decided to create the additional, co-equal middle-phase process of Demonstration Development, a decision that would not be possible under the DoD 5000 acquisition process.

3) Acquisition Chain of Command: From the standpoint of clear decision-making and execution, the advantage lies with the DoD 5000 process for one simple reason: chain of command. An ACTD has at least two co-equal managers as stated earlier, and problems may arise if personalities clash or the managers fail to communicate. Each manager is in charge of his or her responsible area, which should be focused upon clearly defined measures of success. Also, the managers of an ACTD answer to an Overarching Integrated Product Team (IPT) that may meet as seldom as every six months. This contrasts sharply with the DoD 5000 acquisition process, in which a Program Manager is the sole person in charge of decision-making, and has the power to direct the execution of his/her program. There is a clearly defined chain of authority with acquisition programs that does not exist with ACTDs: the IPTs report to the PM, who answers to the Program Executive Officer (PEO), who reports to the Milestone Decision Authority (MDA).

4) Option of Technology-Push Initiation: To begin an acquisition program, a mission requirement must be clearly detailed in a Mission Needs Statement (MNS). In order to draft a MNS, its authors must also conceive a Concept of Operations (CONOPS), which is an idea of how an ACQ product will satisfy the needs outlined in the MNS. The MNS/CONOPS reliance of ACQs contrasts with ACTDs, which can be initiated based on needs but also may begin with nothing more than a technology of possible use to DoD. The SUL ACTD was initiated by a mission need and a preliminary CONOPS, but during the course of its execution it transcended both. That transcendence is evidenced in how the SUL ACTD seeded ideas for a new Marine Corps Logistics Campaign Plan and by the initiation of a more encompassing ACTD as a result of SUL.

5) Speed of Formulation/Selection: An ACTD initiated under standard procedures takes less than a year to gain approval once an idea is submitted. Also, ideas can be submitted from multiple commands, not just Commanders in Chief (CINCs).

Proposals are subjected to a complete multi-level review before being approved by signature of an Implementation Directive (ID). To begin an ACQ, a need must be submitted, reviewed, studied, and justified at many levels before becoming a formal program. The ACQ process includes the drafting and multi-level staffing of a MNS as well as an Operational Requirements Document (ORD). The lesson to be learned from ACTDs is timeliness, evidenced by the several-month approval process required to get SUL approved.

6) Budgetary Freedom: The type of funds used to complete the ACQ and ACTD processes varies. Acquisitions use funds earmarked by Congress for specific programs, and Congress enforces its spending laws by tying each and every ACQ to a budget line, which is not the case with ACTDs. Congress approves the money used to fund ACTDs in broad categories (detailed in Table 2-2). That contrast is minor but significant. It gives defense labs and services the freedom to spend their S&T dollars in a more discretionary manner than procurement funding, a freedom that gives ACTDs flexibility ACQs do not have.

7) Secured Funding: Once the ID for an ACTD has been signed, whichever agency, service, or lab that agreed to fund the demonstration is committed whether or not the ACTD spans several years. Having funds assured and not having to re-justify the existence of their program gives ACTD managers more time and energy to spend on making their ACTD successful. It also allows ACTD managers to make cost/schedule/performance trade-off decisions with a long-term focus without having to worry that their decisions will affect funding. Also, ACTD managers are not forced to compete with other demonstrations for money, at least insofar as their ID has assured them funding for a specified period of time. Once again, freedom equates to flexibility, a lesson ACTDs can teach acquisitions.

An area in which acquisitions have a toe up on ACTDs is that the process used to plan for and secure ACQ funding is designed to allow for producing an end product. ACTD managers are forced by the limitations of their process to act as an ACQ to ensure that their demonstration will have a budget line when it reaches transition. The SUL ACTD managers tried and failed to get funding since their demonstration wasn't backed

by a MNS. If SUL was a formal acquisition program, it would have had a MNS and possibly a budget line, so transiting to a formal acquisition would have been possible.

8) Possible Outcomes: When a warfighting need is identified, a Doctrine, Organization, Training, Education, and Systems (DOTES) analysis is completed. The analysis studies possible solutions that will satisfy the need. For example, if a service identifies a need for improved reliability of jet engines, a DOTES analysis may conclude that further training (the T of DOTES) of mechanics will satisfy the need. In order for an acquisition program to be initiated, the DOTES analysis must conclude that a system (the S of DOTES) is needed, so the end result of an acquisition is a system. Some ACTD proposals, those initiated by requirements pull, are also subjected to a DOTES analyses and the result must also be that a system is needed. The advantage of ACTDs comes from technology push ACTDS. In those cases, *the end-state of the ACTD is a DOTES analysis*, as in "Based on the proven result of the demonstrated technology, we need to change our doctrine and reorganize." The SUL ACTD provides an example of both possibilities since it was initiated by a requirement and was subjected to a DOTES analysis, yet resulted in DOTES outcomes. The Marine Corps Logistics Campaign Plan (doctrine, the D or DOTES) and the follow-on "CSS Commander's Toolkit" ACTD (system, the S of DOTES) that resulted from SUL would never have occurred had SUL been a formal acquisition program.

9) Streamlined Process: The ACQ process is cumbersome compared to the relatively streamlined ACTD process. For example, the DoD 5000 process requires a Test and Evaluation Master Plan (TEMP), an Acquisition Program Baseline (APB), and a Work Breakdown Structure (WBS) in order to move from Phase 1 to Phase 2, as well as a Milestone 2 (MSII) decision to proceed into Phase 2. For an ACTD to proceed from its Formulation and Selection Phase to its Middle Phase only one document is approved and no formal decision made.

The formal acquisition process is typified by documentation, oversight, and formal decisions. All three exist because the process is sequential, and because it was designed to increase the chances of successful programs. In addition, the ACQ process was designed to identify programs with a low chance of success and kill them before they

lose money. This is a rather cumbersome way to accomplish an admirable goal, but the point is that the process is controlled. The ACTD process, on the other hand, while providing freedom to demonstration managers, also gives oversight teams fewer opportunities to cancel demonstrations that go astray. ACTDs are also locked in, as previously mentioned, by the signatures on their IDs, and the only way to kill an established ACTD is to get all signatories to agree again.

B. RECOMMENDATIONS

The goals of the ACTD and DoD 5000 acquisition (ACQ) processes are similar in that they both strive to satisfy requirements identified by warfighters. The difference is that the ACQ process' goal is to fully field a capability useful to warfighters, whereas ACTDs are intended to prove concepts. The Small Unit Logistics (SUL) ACTD was initiated to refine and apply technologies that existed at its inception, with the goal of becoming an acquisition process, and provides and excellent example of how the two processes (ACQ and ACTD) can and should be complimentary.

Based upon the events and experiences of the SUL ACTD, as well as the overviews of both the ACTD and DoD 5000 processes, it is possible to recommend several areas in which the formal acquisition process can be optimized..

1. Initiation

In the context of this thesis, initiation refers to the ease with which either the ACQ or ACTD process can be started. Based upon the procedures detailed in earlier chapters, the initiation protocol for ACTDs represent an improvement upon that of acquisitions. Both demonstrations and acquisitions are reviewed in detail and subjected to estimates, briefings, and needs analyses. The relative speed with which ACTDs are proposed and approved is the core ACTD improvement, and such speed would definitely improve the standard ACQ process.

2. Process

The standard processes followed by acquisitions and demonstrations were designed for different purposes. Formal acquisitions follow a sequential scheme since time is less a factor in judging success. As well, acquisitions are structured around formal Milestone Decisions, which govern whether or not a program can proceed to the next phase, again a time-consuming but possibly cost-saving construct. ACTDs, especially in

their middle phase, have several simultaneously occurring sub-processes that are scheduled that way to save time. Since the ACQ and ACTD processes were designed for different purposes, a one cannot provide lessons to the other.

3. Funding

Funding for both acquisitions and ACTDs goes through the Planning, Programming, and Budgeting System (PPBS), but the relative freedom that DoD has in spending S&T money represents an improvement over the ACQ process. In addition since ACTD funding is locked in with ID signatures, managers working within the demonstration process are subjected neither to yearly reviews nor to inter-ACTD competition for money. The lesson provided is that budget management for ACQ managers would be a significantly less arduous task if acquisition funding resembled Science and Technology (S&T) funding. Reducing the time and effort ACQ Program Managers (PMs) spend on funding matters would free them to concentrate their efforts elsewhere.

4. Management

With either the ACQ or the ACTD process, the skills required of managers are largely the same: project management and leadership. Skill differences largely lie in background expertise in either technology or acquisitions. Both processes are Department of Defense (DoD) and Federal Government inventions, and as such have inherent bureaucratic overhead placed upon them. As was the case with the SUL ACTD, the presence of multiple co-equal managers increases the chances of miscommunication. Another possible outcome, which was not evidenced during the SUL ACTD, is that co-equal managers will have personality conflicts to the detriment of the demonstration's overall success. Based upon the experiences of the SUL ACTD as well as the standard ACTD and ACQ processes, ACTDs do not present a clear managerial improvement over acquisitions.

Despite their considerable differences, both the ACQ and ACTD processes were designed for similar purposes. The ACQ process covers all systems required to satisfy an identified need, while the second was designed to speed mature technologies to warfighters, who may or may not realize their need. Despite the inherent bureaucratic

overhead that results from originating within DoD, the experiences of one ACTD can and has provided lessons applicable to the formal DoD 5000 acquisition process.

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APPENDIX A: ACQUISITION CATEGORIES

ACAT	Selection Criteria	ACAT Designation Authority	Milestone Decision Authority
	Weapon System Programs		
ID	> $335M R&D > $2.135B PMC	USD(A&T)	USD(A&T)
IC	> $355M R&D > $2.135B PMC	USD(A&T)	ASN(RD&A)
IAM	> $30M 1 year > $120M total > $360M LCC	ASD(C3I)	OSD CIO
IAC	> $30M 1 year > $120M total > $360M LCC	ASD(C3I)	ASN(RD&A)
II	> $140M R&D > 645M PMC	ASN(RDA)	ASN(RD&A)
III	< $140M R&D < $645M PMC	MARCORSYSCOM	CMDR, SES
IV (T&M)	< $140M < $645M PMC	MARCORSYSCOM	CMDR, SES, or PM
	Information Technology Programs		
III-IT	> $15M 1 year > $30M total	MARCORSYSCOM	CMDR, SES
IV(T)-IT& IT-AAP	< $15M 1 year < $30M total	MARCORSYSCOM	CMDR, SES, or PM

Source: U.S. Marine Corps Acquisition Procedures Handbook; September 1999

ASD(C3I)	Assistant Secretary of the Navy (Comm., Computers, and Intelligence)
ASN(RD&A)	Assistant Secretary of the Navy (R&D and Acquisitions)
CMDR	Commander
OSD CIO	Office of the Secretary of Defense, Chief Information Officer
PMC	Procurement, Marine Corps
R&D	Research and Development
USD (A&T)	Undersecretary of Defense (Acquisitions and Technology)
SES	Senior Executive Service
PM	Program Manager

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